DOCUMENT RESUME

ED 392 642 SE 057 972

AUTHOR	Camp, Carole Ann, Ed.
TITLE	Invitations to Life's Diversity. Teacher-Friendly Science Activities with Reproducible Handouts in English and Spanish. Grades 3-5. Living Things Science Series.
REPORT NO	ISBN-1-886172-07-2
PUB DATE	95
NOTE	52p.; For other booklets in the series, see SE 057 967-971.
AVAILABLE FROM	Ash Grove Press, Inc., 19 Elm Street, South Deerfield, MA 01373 ($5.95 single copy sold separately; $29.95 set of six, plus shipping and handling).
PUB TYPE	Guides - Classroom Use - Teaching Guides (For Teacher) (052) -- Guides - Classroom Use - Instructional Materials (For Learner) (051)
EDRS PRICE	MF01/PC03 Plus Postage.
DESCRIPTORS	*Biology; *Botany; *Classification; Elementary Education; *Science Activities; Science Instruction; Worksheets
IDENTIFIERS	American Association for Advancement of Science; *Biological Diversity

ABSTRACT

This booklet, one of six in the Living Things Science series, presents activities about diversity and classification of living things which address basic "Benchmarks" suggested by the American Association for the Advancement of Science for the Living Environment for grades 3-5. Contents include background information, vocabulary (in English and Spanish), materials, procedures, extension activities, and worksheets. The worksheets are presented in both English and Spanish versions. Suggestions for use of the activities include using student grouping, a reated readings center, and journal keeping. Activity names are: "What Goes Where?," "All Earth's Critters," "So What's Backbone Got To Do with It?," "Follow Those Tracks," "Flying High," "You're Driving Me Buggy," "In the Swim," "I Think That I Shall Never See," "The Nose Knows," and "Incredible Edibles." A life classification chart and lists of fiction and non-fiction readings are included. (MKR)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
P. Ouellette
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED 392 642

BEST COPY AVAILABLE

INVITATIONS

TO

LIFE'S DIVERSITY

Teacher-Friendly Science Activities

with reproducible handouts in English and Spanish

Grades 3-5

Carole Ann Camp, Editor
Elizabeth Adam
Tammi Frechette
Jean Hansen
Deborah Hayn
Margaret Herzberg
Happy Hill
Matthew Jacobs
Margaret Job
Diane LaFreniere
Carol Menard
Mary-Ellen Nienstadt
Cindy Partridge
Cheryl Smith
Julie White
Carmen Wonsong

LIVING THINGS SCIENCE SERIES

Ash Grove Press, Inc.

LIVING THINGS SERIES

Life's Diversity
Heredity: Generation to Generation
Cells: Life's Building Blocks
Interdependence: Caught in the Web
The Matter-Energy Cycle
Evolving

All books are available from Ash Grove Press, Inc., 19 Elm Street, South Deerfield, MA 01373. For more information or to order call 1-800-834-4200. Each book is sold separately, $5.95, or as a set of six, $29.95, plus shipping and handling.

A percentage of every sale is contributed to groups and organizations which work toward creating a safe and healthy world.

Copyright © 1994 by Ash Grove Press, Inc.

All rights reserved. No part of this work may be reproduced or transmitted in any form by any means--graphic, electronic, or mechanical, including photocopying, taping, or information storage/retreival systems--without written permission of the publisher unless such copying is expressly permitted by copyright law. The exceptions to the foregoing statements are the reproducible handouts within these units which may be reproduced for non-commercial educational purposes without written permission.

ISBN: 1-886172-07-2

Printed in the United States of America

Ash Grove Press is not liable for any accidents that occur in the classroom related to the activities contained in *Living Things*.

Is a trademark of Ash Grove Press, Inc.

ACKNOWLEDGMENTS

The editor acknowledges the help of many people, especially the teachers in Science In The Elementary Classroom, her class at Eastern Connecticut State University who contributed many of their ideas and whose names are listed on the title page. In addition Ash Grove Press would like to thank our readers: Joan Langley, Betsy Waters, Betsy Howlett, Katie Tolles, Mary Lu Robillard, and Barbara Conn. Joan Langley helped compile the bibliography. Thanks also to Stephen Lobo for vital technical and emergency computer assistance.

TABLE OF CONTENTS

Introduction 1

Related Reading for Invitation Center 2

Vocabulary 4

Invitation 1 What Goes Where? 6

Invitation 2 All Earth's Critters 13

Invitation 3 So What's Backbone Got To Do With It? 15

Invitation 4 Follow Those Tracks 16

Invitation 5 Flying High 21

Invitation 6 You're Driving Me Buggy 22

Invitation 7 In the Swim 25

Invitation 8 I Think That I Shall Never See 28

Invitation 9 The Nose Knows 31

Invitation 10 Incredible Edibles 32

Reproducible Handouts 35

Classification chart 43

Key 44

INVITATIONS TO LIFE'S DIVERSITY

INTRODUCTION

Developing observation skills and classification skills are very important to scientists. In *Invitations To Life's Diversity,* students practice observing a variety of living things and practice developing classification systems for living things that make sense to them. In some ways it does not matter what types of objects students practice observing and classifying. It is important to emphasize that the skills being developed are observing and classifying, not memorizing someone else's naming of categories.

In many of the activities in this invitation, students are encouraged to develop their own criteria for sorting and classifying. Scientists have developed ways that make sense to them and students should be provided with the same opportunity. The teacher should not tell the students about any currently accepted scientific classification system until the students have had ample opportunity to find a sorting scheme that makes sense to them. After they have determined their own systems based on their own observations of living things, then the introduction of a scientific classification is appropriate. These other systems should be introduced as another alternative classification that the students can compare and contrast to their own system.

Of course, using real living things is always best. However, in most cases it is difficult to bring hippopotamuses and giraffes into the classroom. In order to provide the optimum opportunities for the students, it is hoped that each activity will progress from the concrete to the abstract. For example, start with actual flowers, then use models of flowers, i.e. silk flowers, then photographs of flowers, then drawings, ending with words representing flowers. Developing good observation skills requires all five senses. If we only use words or drawings, we do not develop all of our senses.

There are many ways to sort living things into groups. There are no right or wrong ways. The first step is to decide which of the many possible characteristics will be the first one used to place certain living things together as a group. Allow the students ample time to compare and contrast their schemes with those of their classmates.

CONCEPTS

1. Living things can be sorted in a variety of ways.
2. Characteristics for sorting are determined by the purpose for the sorting.

SCIENCE JOURNALS

The students are encouraged to keep journals of their observations. They are also encouraged to reflect on their observations as they struggle with the task of developing classifications systems. The students can create their own format for their science journals , the teacher can suggest a format, or the reproducible pages at the end of this book can be used.

CLASSROOM MANAGEMENT

The activities in these INVITATIONS can be managed in a variety of ways. However, students should have many opportunities to work together in cooperative learning groups of 3-4 students. One of the objectives of these INVITATIONS is to have students come to understand that there are many ways to classify living things. By sharing and working together, students will be able to value their fellow students contributions, as well as begin to realize that the process they are experiencing is similar to the process scientists use to classify living things.

If it is possible in your classroom, identify one area, desk or table, as the INVITATIONS CENTER. Include in this location, books from the list below, extension activities, audio tapes of animal sounds, and video tapes on animals or plants that show variety and diversity. If space allows, you may want to have "live" living things in your center, such as fish, gerbils, frogs and tadpoles, ant farms, butterflies, plants, flowers, etc. Be sure to follow the guidelines for your school district and the recommendations from the National Science Teachers Association on living things in the classroom.

RELATED READING FOR INVITATION CENTER
FICTION

Aardama, Verna. Jerry Pinkney, illus. *Rabbit Makes A Monkey of Lion*. New York, Dial Books, 1989.

Ada, Alma Flor. Kathleen Kuclara, illus. *The Rooster Who Went to His Uncles's Wedding*. New York, G.P. Putnam's Sons, 1993.

Anno, Mitsumasa. *The King's Flower*. New York, William Collins, 1976.

Blackmere, Vivien. Susana Martinez-Ostos, illus. *Why Corn Is Golden: Stories About Plants*. New York, Little Brown, 1984.

Buscaglia, Leo. *The Fall of Freddie The Leaf*. N.J, Charles B. Slack Inc. 1982.

Carle, Eric. *The Very Hungry Caterpillar*. New York, Philomel Books, 1981

Cherry, Lynne. *The Great Kapok Tree, A Tale of the Amazon Rain Forest*. New York, Harcourt Brace, 1990.

Cooney, Barbara. *Miss Rumphius*. New York, Viking Press, 1982

Cooper, Susan. Werwick Huttin, illus. *The Silver Cow, A Welsh Tale*. New York, Atheneum, 1983.

Demi. *The Chinese Zoo, Fables and Proverbs*. New York, Harcourt Brace, 1987.

dePaola, Tomie. *The Legend Of The Indian Paintbrush*. New York, Putnam, 1988

de Paola, Tomie. *The Legend of the Bluebonnet*. New York, G.P. Putnam's Sons, 1983.

Ehlert, Lois. *Feathers For Lunch*. New York, Harcourt Brace Jovanovich, 1990.

Gardiner, John Reynolds. Marcia Sewall, illus. *Stone Fox*. New York, Crowell, 1980.

Jonas, Ann. *Aardvarks, Disembark!* New York, Greenville, 1990.

Lionni, Leo. *Swimmy*. New York, Pantheon Books, 1963.

Native American Animal Stories told by Joseph Bruchac. Golden, CO, Fulcrum Pub., 1992.

Noble, Trinka Hakes. *Apple Tree Christmas*. New York, E.P. Dutton, 1964.

The Ox of the Wonderful Horns and Other African Folktales retold by Ashley Bryan. New York, Atheneum, 1989.

Pomerantz, Charlotte. Yossi Abolafia, illus. *Buffy and Albert*. New York, Greenwillow, 1982.

Rawls, Wilson. *Where The Red Fern Grows*. New York, Bantam, 1974.

Rockwell. Anne. *Up a Tall Tree*. New York, Doubleday, 1981.

Schwartz, Howard and Barbara Rush. Stephen Fieser illus. *The Sabbath Lion, A Jewish Folktale From Algeria*. New York, Harper Collins, 1992.

Silverstein, Shel. *The Giving Tree*. New York, Harper & Row. 1964.

Stepfoe, John. *The Story of the Jumping Mouse*. New York, Lothrop, Lee and Shepard Books, 1984.

White, E.B. Edward Franscino illus. *Trumpet of the Swan*. New York, Harper 1970.

Wildsmith, Brain. *Fishes*. New York, Franklin Watts, Inc., 1968.

NON-FICTION

Burnie, David. *Tree.* New York, Alfred A. Knopf, 1988.

Bash, Barbara. *The Tree of Life, The World Of the African Baobab.* San Francisco, Sierra Club Books, 1990.

Carle, Eric. *The Tiny Seed.* New York, Crowell, 1970.

Cole, Joanna. *A Bird's Body.* New York, William Morrow, 1982.

Densmore, Frances. *How Indians Use Wild Plants For Food, Medicine And Crafts.* New York, Dover, 1980.

Feldman, Eve B. Mary Beth Owens, illus. *Animals Don't Wear Pajamas.* New York, Henry Holt & Co., 1992.

George, Joan Craighood. *The Moon Of The Monarch Butterfly.* New York, Crowell, 1968.

George, Joan Craighood. *One Day in the Tropical Rain Forest.* New York, Harper Collins, 1990.

Hiscock, Bruce. *The Big Tree.* New York, Atheneum, 1991.

Goor, Ron and Nancy. Ron & Nancy Goor, illus. *Insect Metamorphosis.* Atheneum, NY, 1990.

Heller, Ruth. *Chickens Aren't the Only Ones.* Grosset & Dunlop, NY, 1981.

Heller, Ruth. *Plants That Never Ever Bloom.* New York, Grosset & Dunlap. 1984.

Heller, Ruth. *Reason For The A Flower.* New York, Grosset & Dunlap, 1983.

Lauber, Patricia. *Summer of Fire: Yellowstone.* New York, Orchard Books, 1991.

Lauber, Patricia. *What's Hatching Out of That Egg?* New York, Crown Publishing. 1979.

Levi, Herbert W. and Lorna R. Levi. *Spiders.* Golden Press, NY, 1968.

Mitchell, Robert T.and Herbert S. Zim. Andre Durenceau , illus. *Butterflies and Moths.* Golden Press, NY, 1962

Parsons, Alexandra. Jerry Young, illus. *Amazing Spiders.* Alfred A. Knopf, NY, 1990.

Parker, Steve. Phillip Dowell, illus. *Pond and River.* Alfred A. Knopf, NY, 1988.

Pallotta, Jerry. Leslie Evans, illus. *The Flower Alphabet Book.* Boston, Quinlan Press, 1988

Selsam, Millicent and Joyce Hunt. Normand Chartier, illus. *Keep Looking.* New York, Macmillan, 1989.

Stokes, Donald W. and Lillian Q. Stokes. Leslie Holt Morrill, illus. *Animal Tracking and Behavior.* Boston, Little, Brown & Co., 1986.

Taylor, Barbara. *Shoreline.* Dorling Kindersley, NY, 1993. Ilustrator: Frank Greenaway

Welch, Martha McKeen. *Sunflower!* New York, Alfred A. Knopf, 1988.

Wood, A.J. April Wilson, illus. *Look Again.* New York, Dial, 1992.

Wyler, Rose. Steven James Petruccio, illus. *Seashore Surprises.* NJ, Julian Messner, 1990.

Zim, Herbert S. and Lester Ingle. Dorothea and Sy Barlowe illus. *Seashores.* Golden Press, NY, 1955.

Zim, Herbert S. and Donald F. Hoffmeister. James Gordon Irving, illus, *Mammals.* New York, Golden Press, 1955.

Zim, Herbert S. and Ira N. Gabrielson. James Gordon Irving, illus. *Birds.* Golden Press, NY, 1956.

Zim, Herbert S. and Alexander C. Martin. Rudolf Freund, illus *Flowers.* Golden Press, NY, 1950.

Zim, Herbert S. and Hobart M. Smith. James Gordon Irving illus. *Reptiles and Amphibians,* Simon & Schuster, NY, 1956.

VOCABULARY

The teacher is encouraged to help students develop their own unique set of vocabulary words depending on the student's interest, experience, and ability. The following words are only suggestions and a very small set of all the possibilities.

annual: a plant that lives for one season only

anual: una planta que dura un año.

aquatic: a plant or animal that lives in or upon the water

acuático: planta o animal que vive en el agua

bulb: a round fleshy underground stem composed of layers of leaves.

bulbo: yema gruesa, por lo común subterránea, cuyas hojas están cargadas con sustancias de reserva

carnivore: a meat eating organism

carnívoro: un organismo que se alimenta de carne

conifer: a tree or shrub that bears cones

conífero: dícese de árboles de hojas persistentes que fruto en cono

cotyledon: a seed or first leaf growing out of an embryo that serves as a food reservoir

cotiledón: forma con que aparece la primera hoja en el embrión de las plantas

deciduous: woody plants that shed their leaves seasonally

caducifolio: dícese de los árboles y plantas de hoja caduca, que se les cae al empezar la estación desfavorable

dicotyledon: a seed plant with two seed leaves or cotyledon

dicotiledóneo: dícese del vegetal cuyo embrión tiene dos cotiledones

endoskeleton: internal framework of vertebrates composed of bone and/or cartilage

neuroesqueleto: esqueleto interno de los animales vertebrados, formado por piezas óseas o cartilaginosas

exoskeleton: the hard outer covering or skeleton of certain animals, especially anthropods

dermaesqueleto: piel o parte de ella engrosada y muy endurecida, frecuentemente en forma de conchas o caparazones, como en los celentéreos, moluscos y artrópodos

herbivores: plant eating animals

herbívoro: aplícase a todo animal que se alimenta de vegetales, y más especialmente de hierbas

invertebrate: an animal without a backbone

invertebrado: dícese de los animales que no tienen columna vertebral

monocotyledon: a flowering plant that develops a single seed leaf, or cotyledon

monocotiledon: dícese del vegetal o planta cuyo embrión posee un solo cotiledón

organism: a complete and entire living thing

organismo: ser viviente

perennial: plant that lives through more than two growing seasons

perenne: una planta que vive más de dos años

petal: any of the colored leaves that make up the flower of a plant

pétalo: hoja transformada por lo común de bellos colores, que forma parte de la corola de la flor

seed: a complete embryo plant which, under the right conditions will grow into a new plant

semilla: parte del fruto que contiene el embrión de una futura planta

vertebrate: an animal with a backbone

vertebrado: un amimal que tiene columna vertebral

INVITATION 1

WHAT GOES WHERE?

BACKGROUND

To introduce classification of living things, students can begin sorting based on generalized categories. A trait that is easily distinguished facilitates the sorting process. A collection of living things, pictures of various living things, audio and video tapes of living things can be displayed in the INVITATIONS center or around the classroom.

MATERIALS

- A wide assortment of living things: i.e. plants, insects, small animals
- A wide assortment of photographs or magazine pictures of living things
- Observation sheet, pp. 37-38
- Picture cards, pp. 7-10
- Word cards, pp. 11-12

HINT: Make copies of pages 7-12 for each student or each group of students. If possible, mount and laminate each page before cutting apart.

PROCEDURE

The best way to begin this activity is with "real" things. After the students have had experience with real things, progress to photographs or magazine pictures, then to picture cards and then to words.

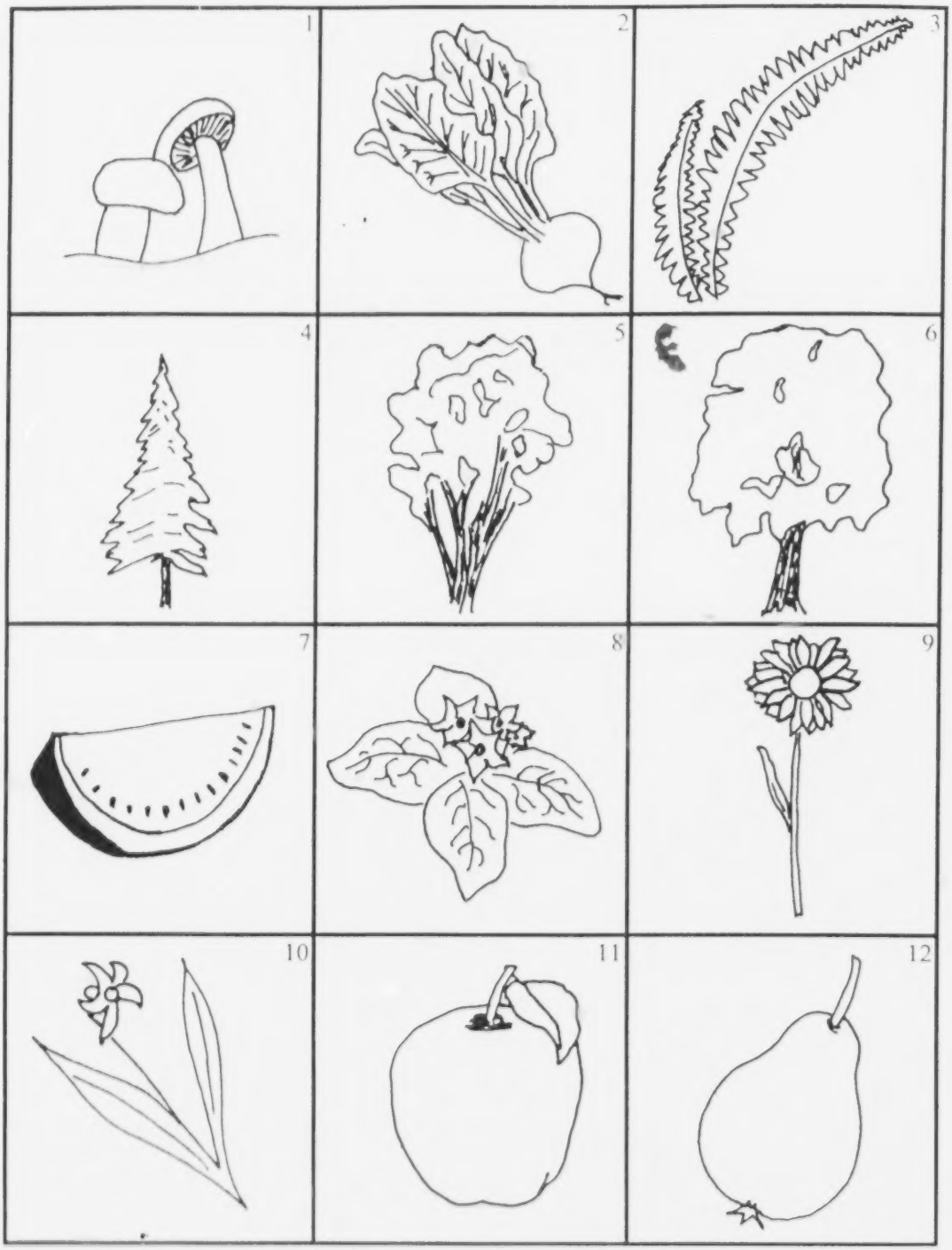
1. Give each student or group of students at least ten living things. Each group does not need to have the same items in their collection. For each object, have students observe and record as many characteristics as possible using all of their senses. You may want to eliminate the sense of taste in the instructions or mark certain items that are all right to taste.
2. Invite students to develop a way to sort their things into two distinct groups based on only one characteristic.
3. Invite students to share their method of sorting with their classmates in other groups or with the whole class. Ask students from one group to try to sort their objects by the criteria suggested by another group.
4. Have students reflect in their journals which criteria worked best. Why do they think so?
5. Play "What about a ?" Have students try to suggest other living things that might not fit into either group or might fit into both groups. Students may want to refine their criteria.
6. Repeat 1-5 using photographs or pictures, picture cards and words.

EXTENSION ACTIVITIES

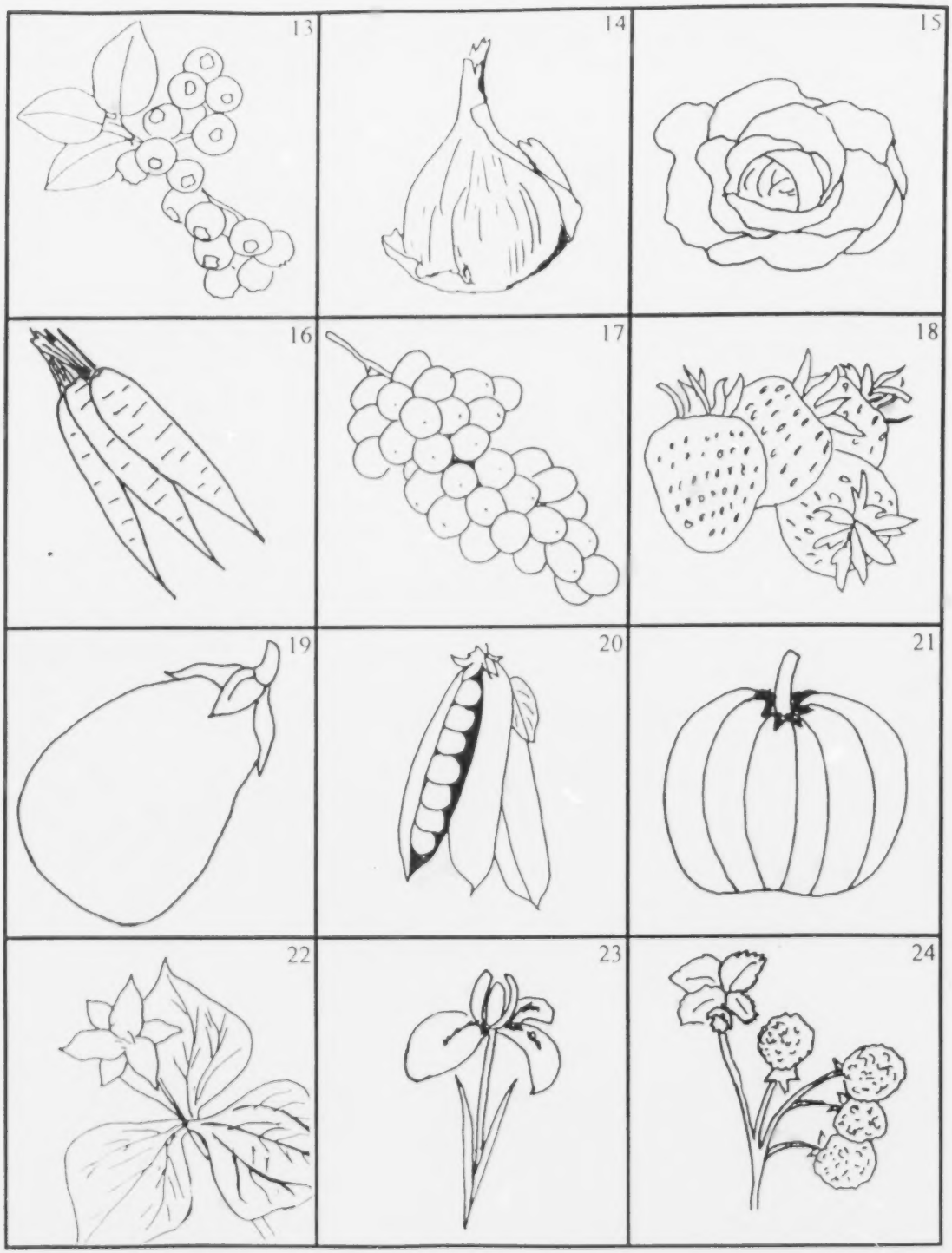
- Invite students to sort the things into 3 distinct categories; then into 4, 5, 6 categories.

- Have students bring in pictures of living things. Using criteria established for classifying, invite the whole class to establish a system for sorting all living things.

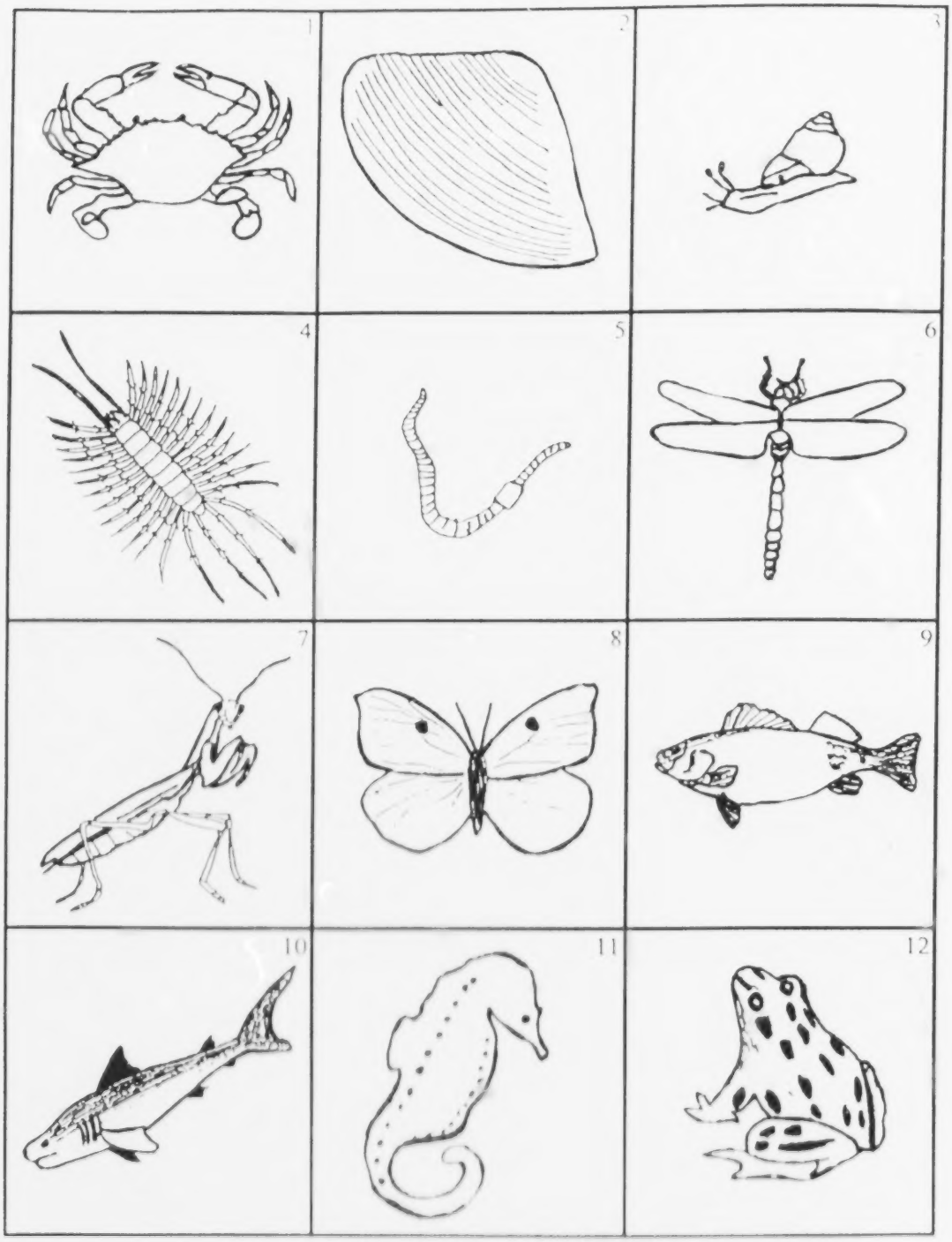
Please reproduce this page.



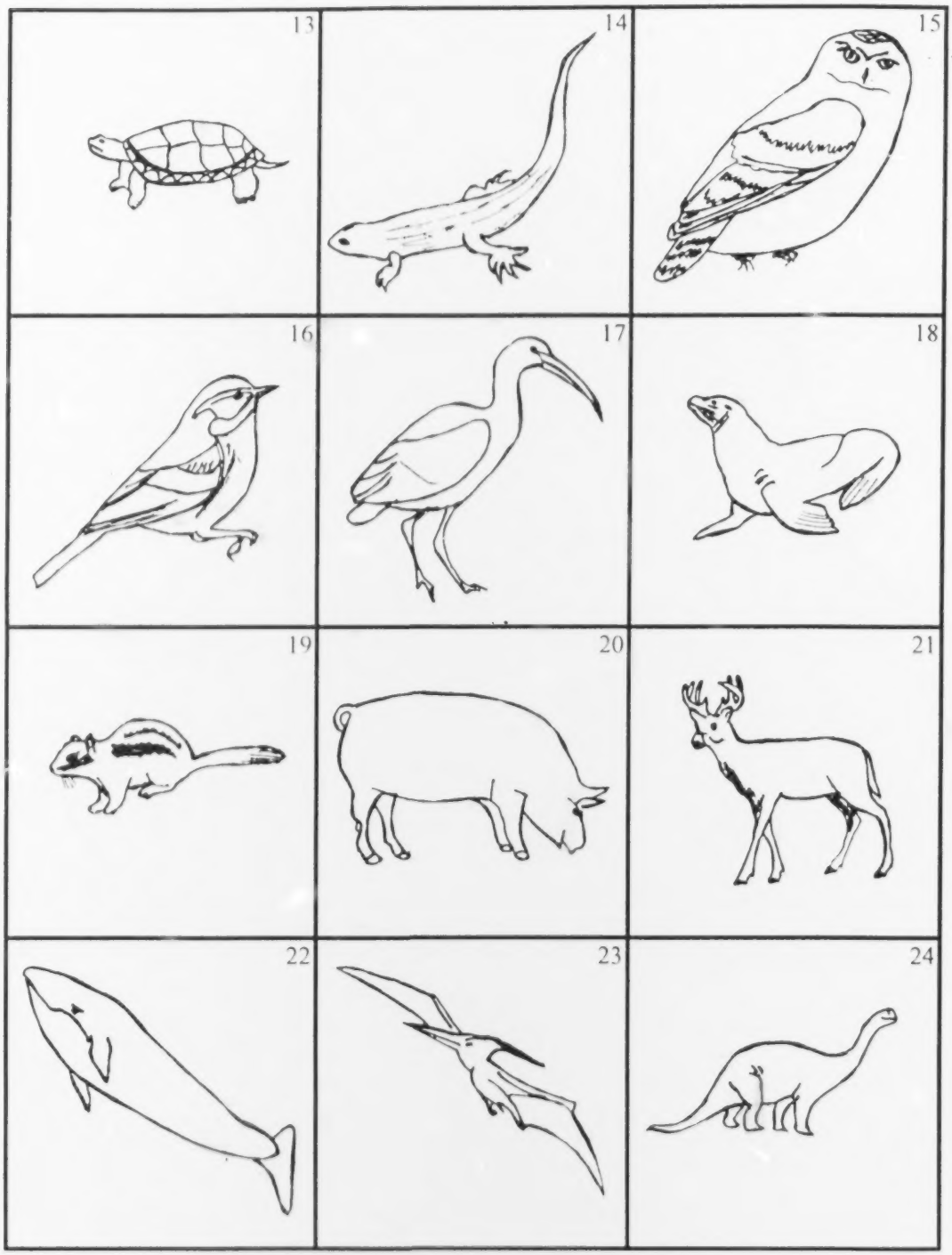
Please reproduce this page.



Please reproduce this page



Please reproduce this page.



Please reproduce this page.

WHALE LA BALLENA	FISH EL PESCADO	DOLPHIN EL DELFÍN
FERN EL HELECHO	IVY LA HIEDRA	ORANGE LA NARANJA
CLAM LA ALMEJA	WHEAT EL TRIGO	OWL LA LECHUZA
ELEPHANT EL ELEFANTE	BOY EL NIÑO	PEAR LA PERA

Please reproduce this page.

BUTTERFLY LA MARIPOSA	APPLE LA MANZANA	TREE EL ÁRBOL
CARROT LA ZANAHORIA	BLUEJAY EL ARRENDAJO	FLOWERS LAS FLORES
LETTUCE LA LECHUGA	BAT EL MURCIÉLAGO	TURNIP EL NABO
CAT EL GATO	HORSE EL CABALLO	SPIDER LA ARAÑA

INVITATION 2

ALL EARTH'S CRITTERS

BACKGROUND

Throughout history people have tried to develop a system to classify all living things. Aristotle developed the first system by dividing plants into three groups: herbs, with soft stems; shrubs, with several woody stems; and trees, with a single woody trunk. He also had three groups for animals: land dwellers, water dwellers, and air dwellers.

MATERIALS

- One stuffed animal per student or one plastic toy animal per student.
- Dichotomous key, pp. 41-42

PROCEDURE

This activity works best for large groups. Students can work individually or in learning groups when developing the classification system.

1. Invite each student to bring a stuffed animal or plastic toy animal to class. HINT: The teacher might have a supply of "out of the ordinary" animals available, such as a crocodile or an aardvark.

2. Invite the students to arrange themselves in groups based upon different physical characteristics of their animals. One student can offer a suggested criterion. i.e. animals with four legs, two legs, no legs, or more than six legs. Repeat this activity several times, allowing different students to suggest the categories. The teacher can also participate by holding one of the "out of the ordinary" stuffed animals.

3. Individually or in cooperative groups, invite students to design a way to classify all the animals in the class, so that each animal is alone in its unique group. Have students develop their classification system using the dichotomous key. To create a dichotomous key, use questions that can only be answered with yes or no. For example, "Is it red?" All the red animals would be in one group and all the non-red animals in another group. Continue asking yes/no questions until all the animals are in groups of one.

4. Share classification systems with the whole class. In journals have students reflect on what happens if one animal belongs to more than one group or if an animal does not fit in any group.

5. Individually or in cooperative groups develop criteria for classifying real animals.

6. Discuss the variety of classifications systems that the students developed.

7. Invite students to find pictures of animals. Using these pictures, test the categorizing schemes suggested by the class. In journals, record which classification systems worked best.

8. Invite students to select an animal to research.

9. Introduce Aristotle's system for classifying animals. Have students group animals they have researched into his system. Reflect in journals about which animals were easy to classify and which animals were not. Discuss similarities and differences between students' systems and Aristotle's.

10. Invite students to research current sorting systems developed by scientists. For example,

mammals, birds, fish, insects. Discuss similarities and differences between these sorting systems and students' systems.

EXTENSION ACTIVITIES

- Write an imaginary dialogue between a real animal and a stuffed animal. In what ways are they alike? In what ways are they different?
- Have students draw an animal on a square of material using fabric markers or paints. Sew the squares together and make a quilt and give it to a homeless shelter.
- Developing all the senses is important. If you have access to tapes or records of animal sounds or bird sounds, the students can develop a classification system for animals based only on the sounds the animals make.

SAMPLE DICHOTOMOUS KEY

INVITATION 3

SO WHAT'S BACKBONE GOT TO DO WITH IT?

BACKGROUND

One way to classify animals is by vertebrates and invertebrates. Vertebrates are animals that have a backbone. Mammals, birds, fish, and reptiles are vertebrates. Animals such as worms, insects, clams, crabs lack a backbone and are called invertebrates.

MATERIALS

- Pictures of vertebrates and invertebrates
- Two hula hoops or other large circles that can be placed on the floor
- Cardboard tubes, wrapping paper, egg cartons
- Paper punches or leather punches
- A variety of tapes, masking tape, duct tape
- A variety of kinds of wire and wire cutters
- A variety of yarns, strings and ribbons
- Any other good junk

PROCEDURE

1. Discuss with the students that one way to classify animals is by determining whether the animal has a backbone or not. If appropriate introduce the words vertebrates and invertebrates. It is not necessary to use these terms, as long as the students understand that some animals have backbones and some do not.

2. Give each student or group of students a picture of an animal. Invite the students to put their picture in the appropriate circles (hula hoops) marked WITH BACKBONE or WITHOUT BACKBONE.

3. Invite students to create an imaginary vertebrate with art supplies provided. Have students name their animal and list its unique characteristics. In what ways is this imaginary animal similar to and/or different from real vertebrates.

EXTENSION ACTIVITIES

- Write a story about the created animal. Where does it live? What does it eat? How long does it live? In what kinds of environments would this animal survive? In what kinds of environments would this animal become extinct?

- Create an animal dance with or without music. For vertebrates, move like a fish, giraffe, etc. For invertebrates, move like a worm, a spider.

- Charades: Students pick a name of an animal out of a hat, act out the animal, other students guess whether the animal being acted out is a vertebrate or an invertebrate.

INVITATION 4

FOLLOW THOSE TRACKS

BACKGROUND

Many animals can be identified by their tracks. Classifying animals by their tracks is another way to classify animals into groups.

MATERIALS

- Card sets of tracks, pp. 18-19

HINT: Make enough copies for each student or each group of students to have a set of the tracks. If possible, mount and laminate each page before cutting apart.

PROCEDURE

1. Give students a complete set of cards of animal tracks. Invite them to record observations of tracks, remembering to record similarities and differences.

2. Invite students to develop a way to categorize the tracks. Share these systems with other students.

3. Suggest that the following is one way to classify tracks: side to side tracks, tracks in a straight line, tracks in pairs, tracks with tail drags. Invite students to classify the track cards using this system. Record any similarities and differences between this system with their own system.

4. Depending on your location and the time of year, it may be possible for you to take the students on a field trip where there may be tracks. Allow them the opportunity to observe the tracks and record their observations.

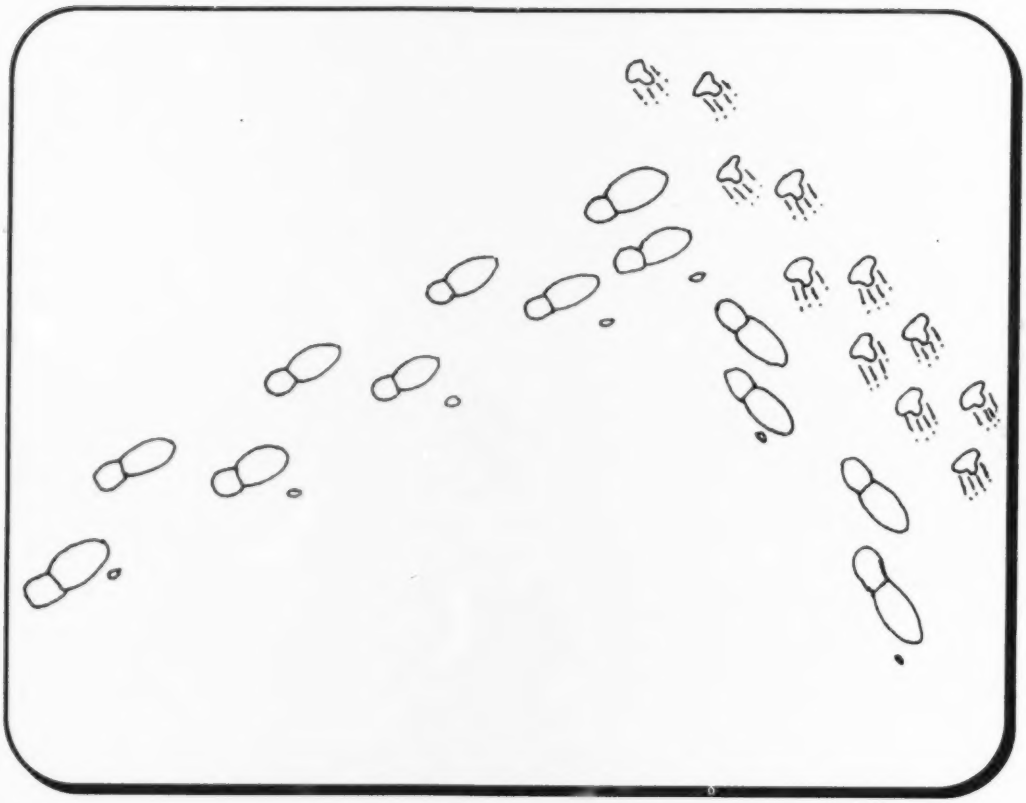
EXTENSION ACTIVITIES

- Invite students to invent a game using the track cards.

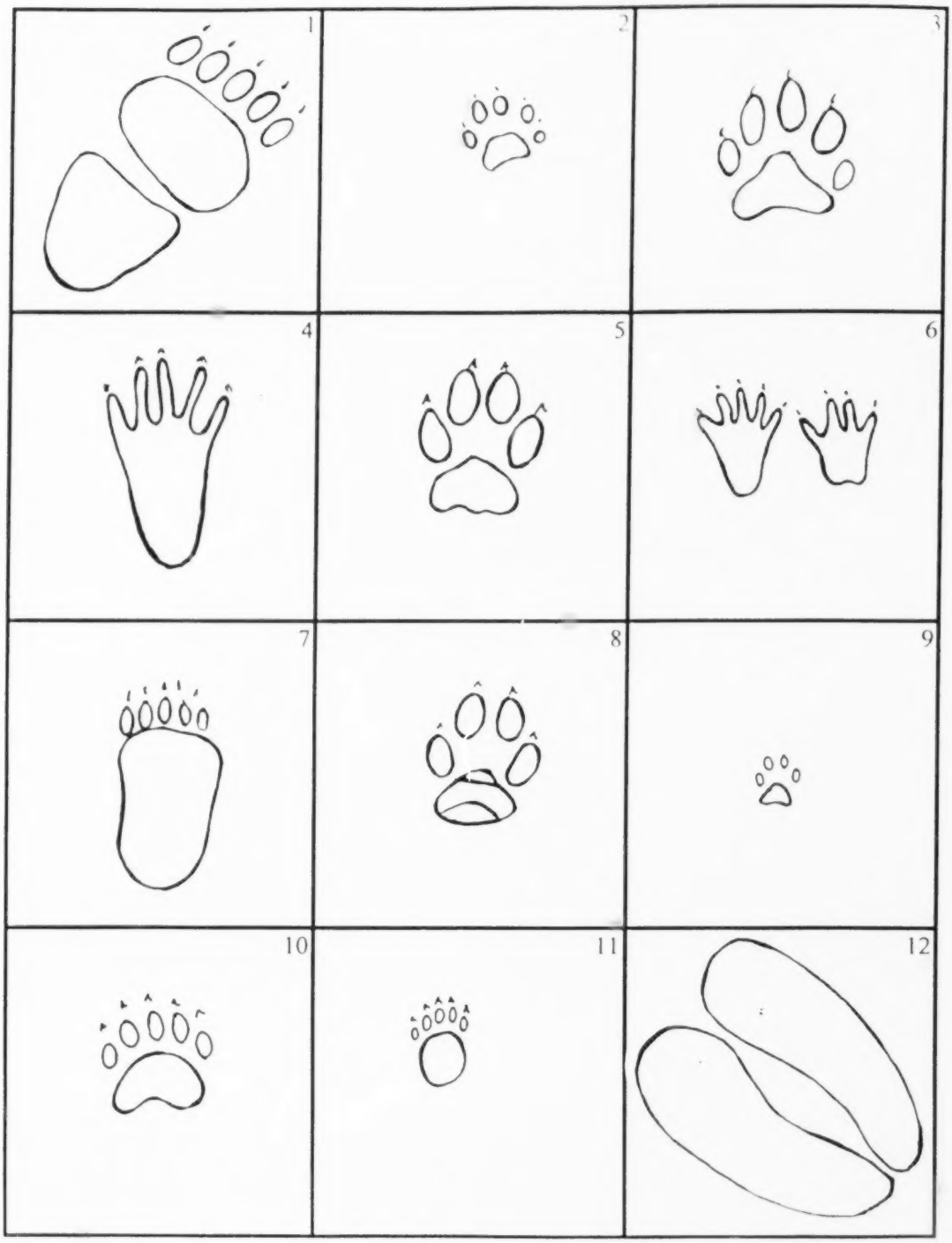
- Create a track picture from which others can develop a possible story.

SAMPLE

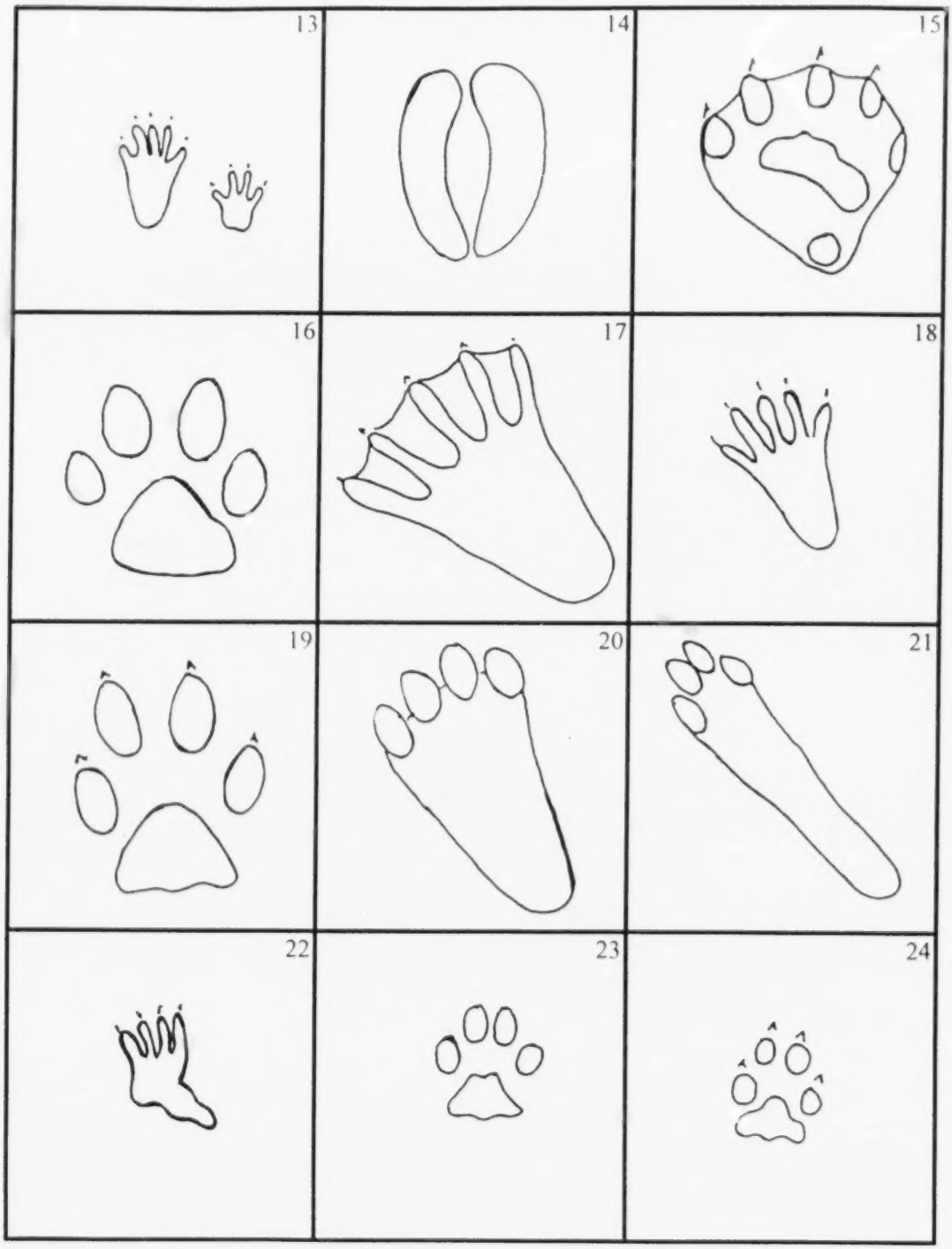
What happened here? Create a story to explain the tracks.



Please reproduce this page



Please reproduce this page.



Tracker_____

TRACK STORIES

Create a track story. Exchange your track story with a friend. Create a story to explain the track story your friend created.

Rastreador_____

CUENTOS DE HUELLAS

Escribe un cuento sobre huellas. Intercambie su cuento con un amigo(a). Crea un cuento que explique el cuento de su amigo(a).

INVITATION 5

FLYING HIGH

BACKGROUND

A bird's bones and feathers are light, have hollow parts, and enable a bird to fly.

This activity contrasts the features of bird bones to cattle bones, which are not suitable for flight. Bird feathers can be purchased through a biological supply house, pet store, or zoo.

The chicken and beef bones should be boiled prior to the activity to insure that they are clean and free of debris. Refrigerate bones until use. Large beef bones should be split to show their internal structure. A butcher can split the beef bones for you.

MATERIALS

- Bird feathers
- Hand lenses or magnifying glasses
- Chicken bones
- Beef bones
- Pliers
- Observation sheet pp. 37-38

PROCEDURE

1. Invite students to carefully cut the feather in half or provide students with cut feathers. Record observations and drawings of the feathers in journals. Magnifying glasses may be helpful.

2. Invite students to break a chicken bone into two pieces. Pliers will be helpful. Record observations and drawings in journals.

3. Invite students to record observations of the split beef bones in their journals.

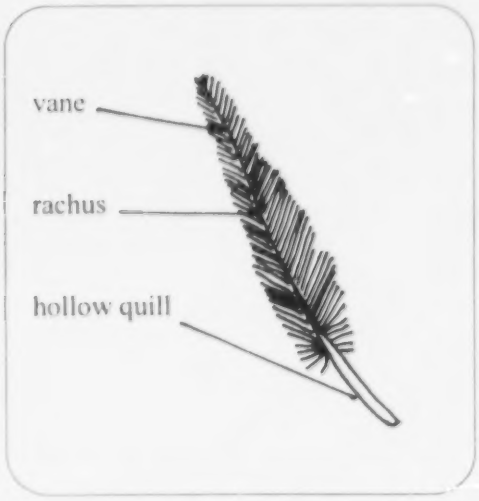
4. Compare and contrast the differences and similarities between the chicken bones and the beef bones. Based on their observations, invite students to discuss why cows might not be able to fly.

4. Have students develop another classification system based on their findings from this activity.

EXTENSION ACTIVITIES

- Have students research the following: Are there any birds that cannot fly? Are there animals that are not birds that can fly? In journals, reflect on what makes a bird a bird and when is an animal not a bird?

- Discuss how to make a kite. Based on observations with the birds, which material would you use? Why? Make kites using a variety of materials and test them for flying ability.



INVITATION 6

YOU'RE DRIVING ME BUGGY

BACKGROUND

There are hundreds of thousands of different kinds of insects. There are more kinds of insects than all other species of animals put together.

Most insects are small in comparison to other animals and insects have no internal skeleton. Most adult insects have 3 distinct parts of the body: the head, the thorax, and abdomen. Most adult insects have 6 legs attached to the thorax.

MATERIALS

- Pictures of bugs and insects.
- Bugs and insect cards, pp. 24-25
- Assorted art supplies, poster board, glue, assorted tissue paper, scissors, pipe cleaners

PROCEDURE

1. Show students pictures of bugs and insects and butterflies. Discuss the differences and similarities.

2. Have students make a model of an insect or a bug. Encourage the students to be as accurate as possible, given the materials available. It helps if the insect models are identifiable. Younger children might draw pictures.

3. When all the bugs and insects have been created, sort the created insects into two categories.

4. Invite students to sort insects and bugs into 3, 4, or 5 unique categories.

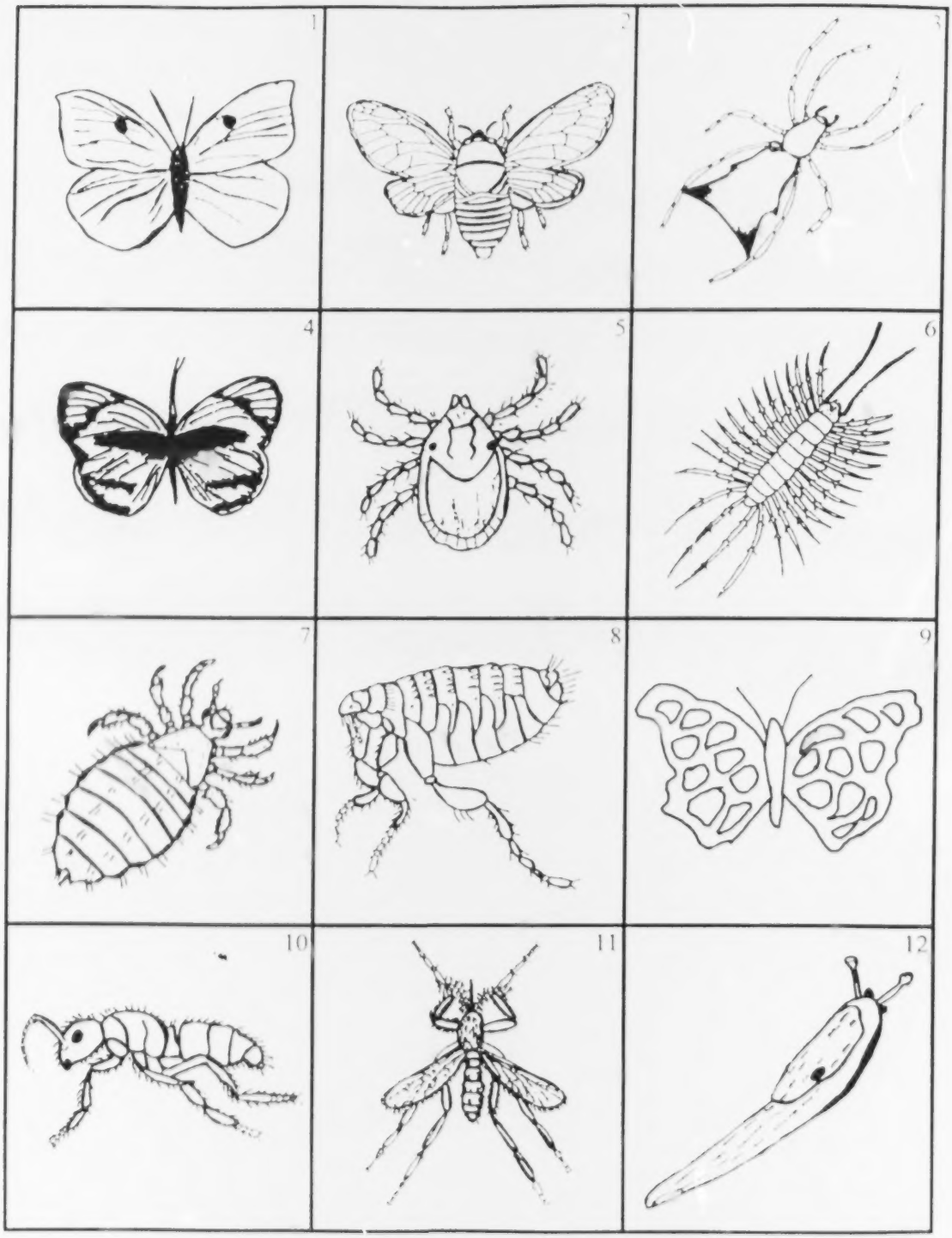
5. Invite students to sort insects into 2 categories, those that are helpful to humankind and those that are not. Have them reflect in their journals on whether some insects should be destroyed, mosquitoes, for example. Have a panel debate for or against insects.

6. If possible acquire an ant farm or butterfly farm for the classroom. Many science equipment supply houses have these available. Make observations regularly recording both picture and verbal observations.

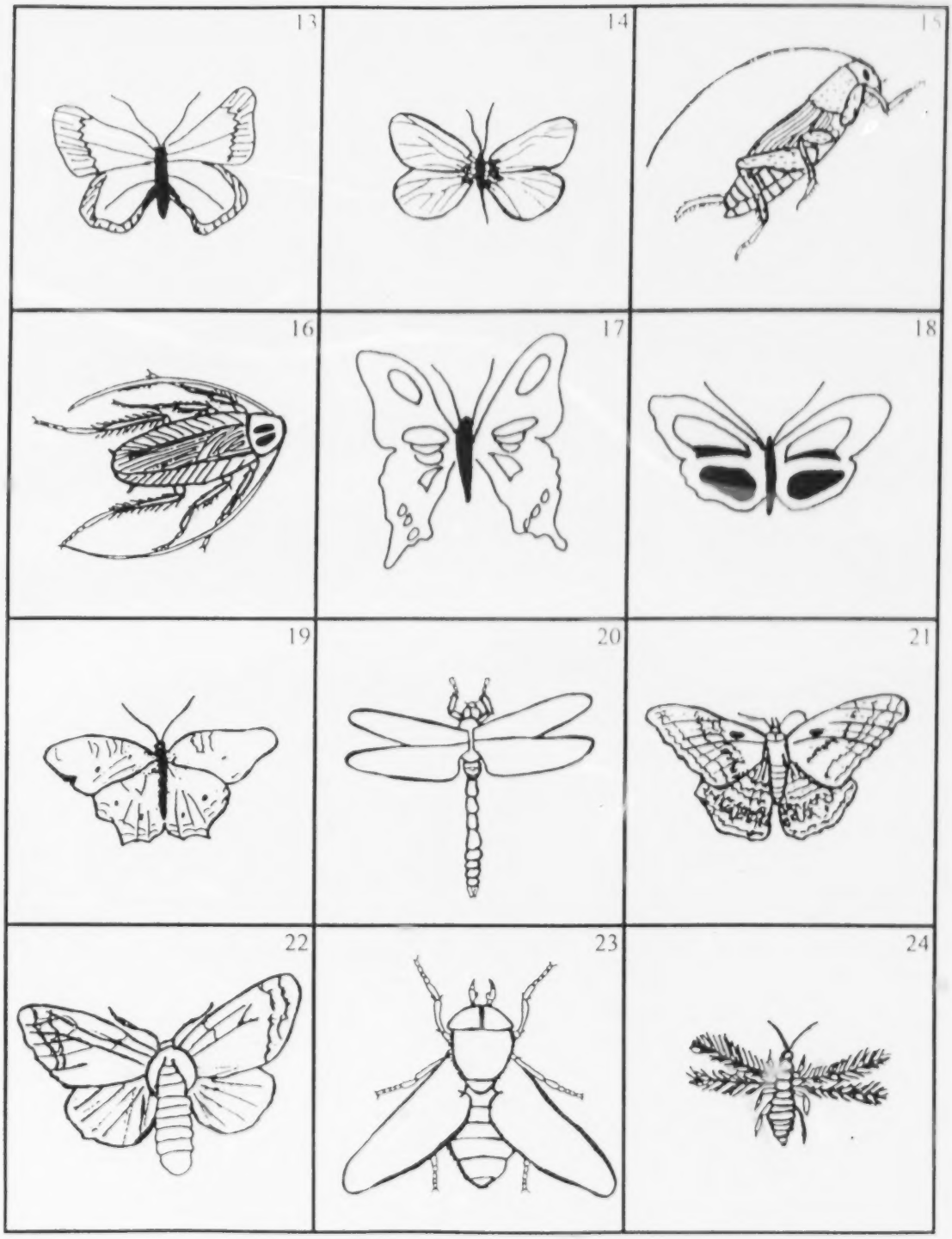
EXTENSION ACTIVITIES

- Invite a bee keeper to talk to the class.
- Write a biography of an entomologist.
- Have a school wide "hug-a-bug" day. Invite naturalists from your area to participate.

Please reproduce this page



Please reproduce this page.



INVITATION 7

IN THE SWIM

BACKGROUND

Many different kinds of animals can swim. Even dogs swim. What makes fish different from all other animals that swim? How do we classify whales and dolphins?

MATERIALS

- Magazines that can be cut up with pictures of animals that swim: crocodiles, clams, lobsters, water bugs, frogs, tadpoles
- Word cards, pp. 27-28

PROCEDURE

1. Invite each student to find pictures of at least five animals that live in the water. If possible laminate the pictures or mount on stiff cardboard.
2. In groups of 4-5 students, have students develop a way to classify all the pictures in their group. Students may choose color, size, or some other quality that appeals to them, even qualities like beautiful or ugly. For this part of the activity allow whatever characteristics the students suggest. Have students create a dichotomous key. See sample p. 14
3. Share the dichotomous keys created. Using one of the keys suggested, invite each group to try to sort their set of animal pictures according to the selected designated key.
4. Reflect in journals about which keys worked for a given set of pictures and which did not.
5. Develop a classification system that clearly sorts all the animal pictures into 3 distinct groups. Using the classification system from one of the groups, have all the groups sort their pictures using that criteria.
6. Reflect in journals about the animals that didn't fit easily into a group. Invite students to revise their classification systems based on these reflections.
7. Try 4 distinct groupings, then 5. Remember, it is important for students to develop their own classification systems.
8. Develop a system that will classify all the animals on the planet that can swim.
9. Have students vote on the best system. Using the class's choice of the best classification system, create a bulletin board using this system. Challenge students to find pictures or stories of animals that swim which do not fit into the classification system. Encourage arguments and debate.
10. Have students compare the best classification system developed in #9 to the best currently accepted system used by scientists.
11. Using the set of animals on pp. 27-28, classify using their group's classification system. Reflect in journals about which were easy to classify and which were difficult. Why? If students do not know what a particular animal is, encourage research on this animal. After students have had ample opportunity to develop their own systems ask them to reflect in their journals on the following question: What makes fish different from other animals that swim?

EXTENSION ACTIVITIES

- Create a fictitious creature that swims. Write a story for a class book entitled, "Creatures That Swim." Give the book to the school library.
- Take a field trip to an aquarium.
- Invite someone who works in a pet store that specializes in fish to speak to the class.

OCTOPUS EL PULPO	LEECH LA SANGUIJEULA	WATER STRIDER EL ANDARRÍOS
SHARK EL TIBURÓN	LUNGFISH EL PEZ DÍPNEO	FROG LA RANA
PUFFIN EL FRAILECILLO	PORPOISE LA MARSOPA	OTTER LA NUTRIA
CRAB EL CANGREJO	BLUE FISH EL PEZ AZULADO Y PLATEADO	MANATEE LA MANATÍ

SAND DOLLAR EL ERIZO DE MAR APLANADO	SPONGE LA ESPONJA	JELLY FISH LA MEDUSA
CORAL EL CORAL	STARFISH LA ESTRELLAMAR	LOON EL SOMORGUJO
HUMAN EL HUMANO	DOG EL PERRO	SEAL LA FOCA
WHALE LA BALLENA	CLAM LA ALMEJA	LOBSTER LA LANGOSTA

INVITATION 8

I THINK THAT I SHALL NEVER SEE

BACKGROUND

As with all living things there are many different ways to sort and classify. Most people will sort trees into evergreens and not evergreens, or trees with needles and trees without leaves. In the plant kingdom there are many phylum including bryophyta and tracheophyta. Within the phylum tracheophyta there are 3 classes two of which are gymnosperms and angiosperms. Most trees belong to these two classes.

Gymnosperm means "naked seed." Angiosperm seeds develop within a protective wall. One of the subclasses of gymnosperms is conifers. Conifer refers to the woody cone seen on many evergreens: pines, spruces, firs and sequoia. A few shrubs are also conifers: i.e. yews and junipers.

Angiosperms are basically flowering plants. There are 2 subclasses: monocots and dicots. A monocot has a single cotyledon (seed leaves that develop in the embryo plant) and a dicot has two. Therefore a palm tree is a monocot angiosperm and maple, beech, chestnut and oak trees are dicot angiosperms.

It is not necessary for the students to memorize these distinctions, or to even be aware of these distinctions. Allow students the opportunity to mentally struggle with a way to classify trees. Questions like "What about a palm?" will help students expand and revise their own mental constructs.

MATERIALS

- Pictures of trees. The Arbor Day Federation will be happy to provide pictures of trees.
- Set of pictures of leaves on pp. 30-31. Make a set for each student or group of students.

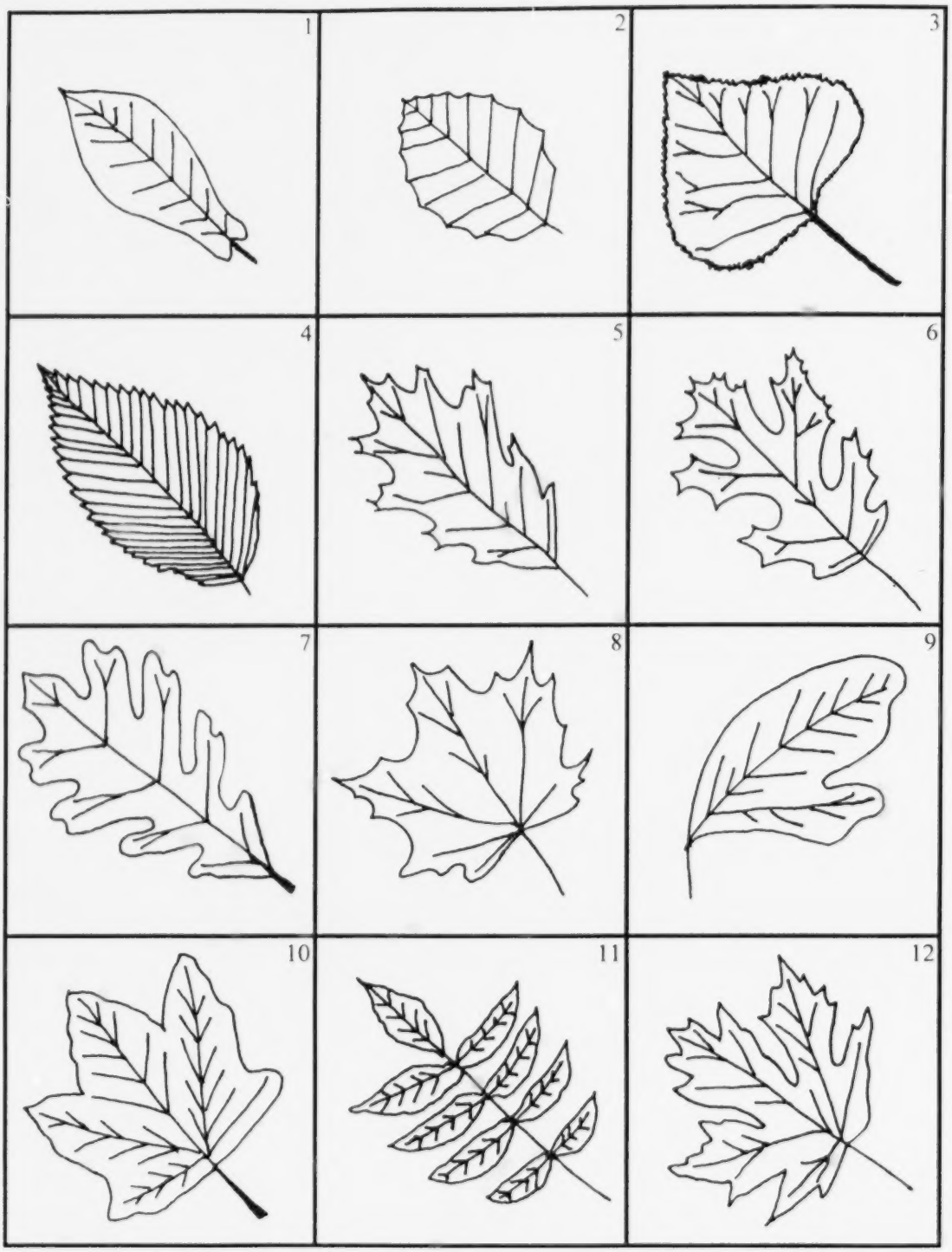
PROCEDURE

1. This activity should be started one month before trees begin to change in the spring. Allow at least 1 1/2 months observation time before the classification process in class actually begins. Invite students to select a tree that they will observe 3 times a week for the next month. Students should record their observations both in words and in pictures. Have students tie a ribbon around the end of an easily observable branch. The portion selected should be at the end of a branch and about 3 inches long. Have students draw this section of the branch at each observation and reflect on any changes that are occurring.
2. Have students research the kind of tree they are observing. Possibilities include talking to family members or neighbors. If the tree is on school property, talking to the sexton or teachers that have been at the school for some time. It is also possible to tell types of trees by overall shape, bark, and buds. Leaves of course, are the easiest method. When the leaves emerge, students can verify their predictions.
3. Towards the end of the month of observation, invite students to develop a classification system for all the trees represented by students in the class. Possibilities include; single truck, multiple trunks; needle like leaves, broad leaves, seeds in cones, seeds not in cones, flowering, non-flowering.
4. Using either real leaves or the set of leaf cards on pp. 30-31, classify trees using only leaves as the criteria.
5. Invite students to develop a variety of different classification systems. For example, a classification system based on uses of trees or a classification system based on homes, human and animals.

EXTENSION ACTIVITIES

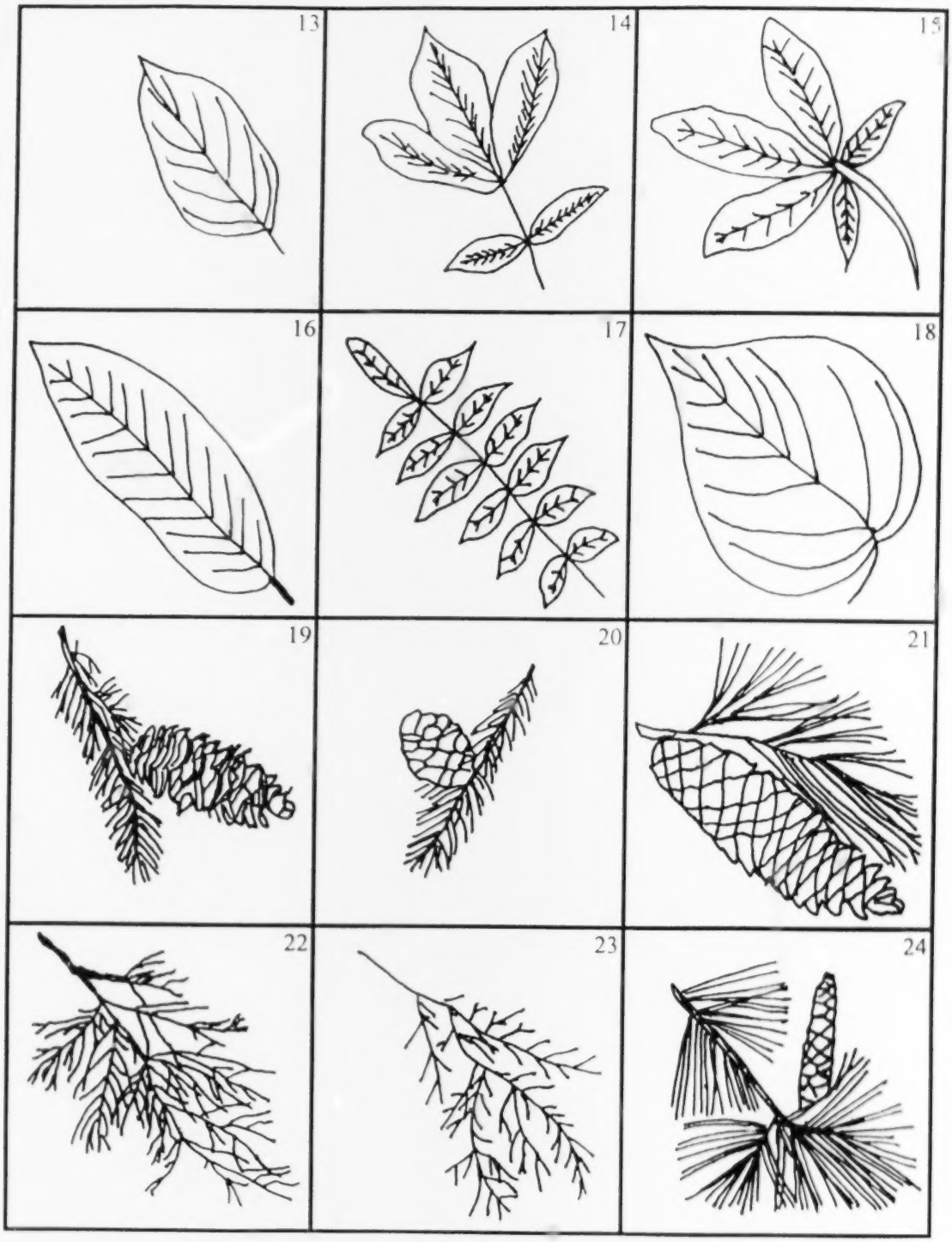
Invite students to write a poem about their tree and illustrate the poem. Collate the poems and illustrations together as a book on trees. Donate a copy of the book to the school's library.

Please reproduce this page.



36

Please reproduce this page.



INVITATION 9

THE NOSE KNOWS

BACKGROUND

Scientists use all five senses when making observations. The primary focus of this activity is to develop a classification system for flowers. The flowers will be classified using the sense of smell as well as the sense of sight. Plants that live for only one season are called annuals. Biennial plants have a life cycle that lasts 2 growing seasons, and perennials live for many years. The number of petals in a monocot is usually a multiple of 3. The number of petals in dicots are usually multiples of 4 or 5. NOTE: If students have allergies you may want them to skip this activity.

MATERIALS

- A variety of flowers. Ask your local florist to save flowers that are to be discarded.
- Seed catalogs
- Pictures of plants from around world
- Observation sheet, pp. 37-38

PROCEDURE

1. Have students smell at least 10 different kinds of real flowers. They do not need to be cut flowers. Mums, African violets, or other flowering potted plants will also work. You may want to put each kind of flower in a different location around the room, so the smells do not contaminate each other. Have groups of students move from flower to flower.

2. On the observation sheet, describe the flowers using only the sense of smell.

3. Challenge the students to develop a classification system for all the flowers in the room based solely on aroma. Ask students to reflect in their journals on the positives and negatives of trying to develop a classification system using only the olfactory sense.

4. Have students develop a classification system using visual observations.

5. Invite students to find pictures of other flowering plants, especially those that are not indigenous to your part of the world. Using the classification systems developed by the group, have them sort the pictures.

6. In journals, have students reflect on the process used to develop the classification

7. If students did not suggest annual, biennials, or perennials, invite them to try this system as a way to classify the real flowers or the pictures of flowers.

8. Develop a classification system based solely on the number of petals the flowers have.

EXTENSION ACTIVITIES

- Reflect on the purpose of flower smells and flower petals.

INVITATION 10

INCREDIBLE EDIBLES

BACKGROUND

There are many ways to classify plants. One possibility is to classify plants as edible and non-edible. Based on which part of the plant is eaten, edible plants can be further classified into categories such as fruits, seeds, roots, stems, leaves and flowers. This is one of many methods of plant classification. Remind students that they shouldn't eat any plants until they have checked with an adult. Some discussion of unfamiliar plants may be necessary in helping students determine the edible from the non-edible parts.

MATERIALS

- A wide variety of edible plants. Include plants that represent different cultures and parts of the world
- A wide variety of pictures of edible plants

PROCEDURES

1. Have students list the types of vegetables that they or their families eat. Develop a way to classify the plants on the list into 2 or more unique groups.

2. In journals, record observations of a variety of edible plants. Develop a way to classify the edible plants.

3. Discuss the similarities and differences in the classification systems developed in #1 and #2.

4. If students have not suggested that the edible plants be grouped by types of edible parts, suggest the following as one way to classify edible plants: fruits, seeds, roots, stems, leaves and flowers. Have students group edible plants using this classification system.

EXTENSION ACTIVITIES

- Invite students to explore edible plants in different cultures or different areas of the United States or from different parts of the world. Students could interview their families or their friend's families about the types of plants that they eat.
- Go a on a field trip to a grocery store with a large produce section. Ask the produce manager to show the crates that the different produce came in. Have the student identify on a map the locations of the origins of the different plants.
- Draw a picture of an imaginary plant where all the parts of that plant are edible. You can refer to the examples used for this activity for some ideas. Label the parts of your plant using the 6 categories used above for classifying plants as edible.
- Have an edible plants potluck supper, lunch, or snacks.
- Make an edible plants cookbook.

ROOTS **LAS RAÍCES**	**STEMS** **LOS TRONCHOS**
FRUIT **LA FRUTA**	**LEAVES** **LAS HOJAS**
SEEDS **LAS SEMILLAS**	**FLOWERS** **LAS FLORES**

MY

SCIENCE

JOURNAL

Scientist's Name _____

MI

CUADERNO

DE

CIENCIA

Nombre del Científico_____

OBSERVATIONS

For each object list at least six observations, try to use all of your senses. Draw a picture of the object in the box below.

Object_____

1.

2.

3.

4.

5.

6.

OBSERVACIÓNES

Para cada objeto menciona, por lo menos, seis observaciónes. Trata de utilizar todos sus sentidos. Haz un dibujo del objeto en el rectángulo.

Objeto_____

1.

2.

3.

4.

5.

6.

Journal Thoughts and Ideas
Invitation_____

Books I've read on this topic

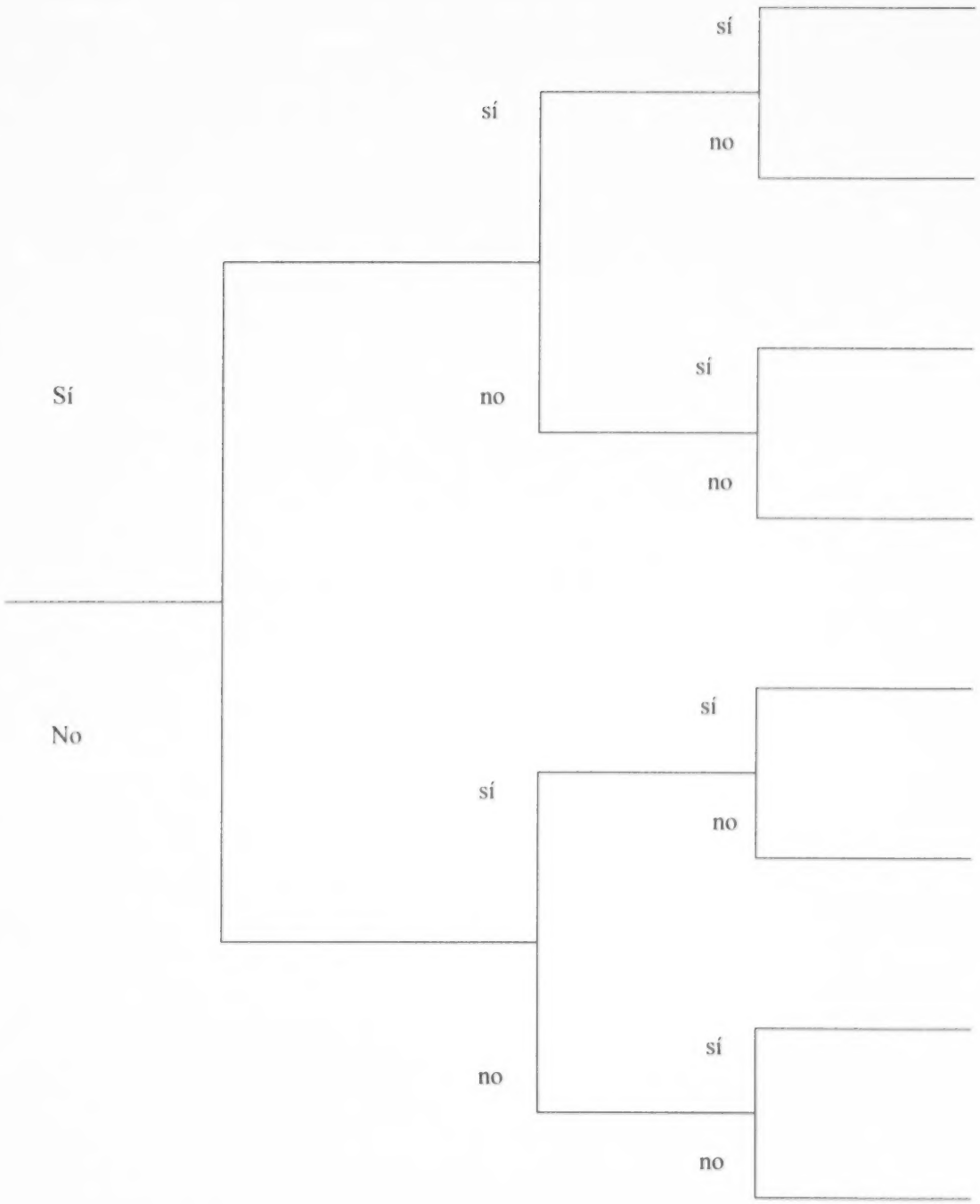
Today I learned...

Cuaderno de Idéas
Sugerencias_____

Libros que he leído sobre este tema.

Aprendí hoy...

On the horizontal lines, write a question that can only be answered by yes or no and will divide the group into two unique categories.



En las líneas horizontales, escribe una pregunta que se puede contestar con un sí o no y que divida el grupo en dos categorías.

FOR THE TEACHER:

For many years, scientists divided all living things into two major groups, animals and plants. As more and more organisms were found, scientists added a third group, then a fourth, then a fifth. Some taxonomists add a sixth. There is no general agreement among the scientific community as to how many kingdoms there are. There is no completely satisfactory way of classifying. Each system has its advantages and disadvantages. The following chart is for the teacher's interest only. Students will develop their own classification systems in the invitations in this book. Their system is no less correct than the scientists. Presented here is a five kingdom system. In a four-kingdom system, the fungi are usually classified as plants. In the three-kingdom system, some protists are classified as plants and some as animals.

CHARACTERISTICS	MONERA	PROTISTA	FUNGI	PLANTAE	ANIMALIA
Nuclear membrane	no	yes	yes	yes	yes
Mitochondria	no	yes	yes	yes	yes
Ability to perform photosynthesis	some	some	no	yes	no
Ability to move	some	some	no	no	yes
Body form	one cell	one or more celss	one or more cells	many cells	many cells
Reproductive structures	one cell	one cell	many cells	many cells	many cells
Nutrition	absorption, photosyn-thesis, or chemosyn-thesis	absorption, photosyn-thesis, or ingestion	absoption	photosyn-thesis	ingestion
Nervous system	none	none	none	none	yes
Example	Bacteria	Protozoa	Fungi	Plants	Animals

Key to Drawings

PLANTS pp. 7-8		BUGS AND INSECTS pp. 24-25		TRACKS pp. 18-19		LEAVES pp. 30-31		ANIMALS pp. 9-10	
1. Mushroom	El Champiñon	1. Butterfly	La Mariposa	1. Black Bear	El Oso Negro	1. Mountain Ash	El Fresno	1. Crab	El Cangrejo
2. Beet	La Remolacha	2. Cicada	La Cigarra	2. Mink	El Vison	2. Beech	La Haya	2. Clam	La Almeja
3. Fern	El Helecho	3. Spider	La Araña	3. Fisher	La Marta del Canadá	3. Poplar	El Alamo	3. Snail	El Caracol
4. Spruce Tree	La Picea	4. Butterfly	La Mariposa	4. Raccoon	El Mapache	4. Elm	El Olmo	4. Centipede	El Ciempiés
5. Birch Tree	El Abedul	5. Tick	La Garrapata	5. Coyote	El Coyote	5. Red Oak	El Roble Rojo	5. Worm	La Lombriz
6. Maple Tree	El Arce	6. Centipede	El Ciempiés	6. Woodchuck	La Marmota Grande	6. Scarlet Oak	La Coscoja	6. Dragonfly	La Libélula
7. Watermelon	La Sandia	7. Louse	El Piojo	7. Porcupine	El Puerco Espin	7. White Oak	El Roble Blanco	7. Praying Mantis	La Mantis Religiosa
8. Trailing Arbutus	El Madroño	8. Flea	La pulga	8. Red Fox	El Zorro Rojo	8. Norway Maple	El Arce	8. Butterfly	La Mariposa
9. Daisy	La Margarita	9. Snout Butterfly	La Mariposa	9. House Cat	El Gato	9. Sassafras	El Sasafrás	9. Fish	El Pescado
10. Lily	La Azucena	10. Ant	La Hormiga	10. Badger	El Tejón	10. Sycamore Maple	El Arce Sicomoro	10. Shark	El Tiburón
11. Apple	La Manzana	11. Mosquito	El Mosquito	11. Skunk	La Mofeta	11. Black Ash	El Fresno Negro	11. Seahorse	La Morga
12. Pear	La Pera	12. Slug	La Babosa	12. Moose	El Alce	12. Silver Maple	El Arce Plateado	12. Frog	La Rana
13. Blueberries	Los Arándanos	13. Butterfly	La Mariposa	13. Squirrel	La Ardilla	13. Dogwood	El Cornejo	13. Turtle	La Tortuga
14. Garlic	El Ajo	14. butterfly	La Mariposa	14. Deer	El Ciervo	14. Shagbark	El Nogal	14. Salamander	La Salamandra
15. Cabbage	La Col	15. Cricket	El Grillo	15. Otter	La Nutria	15. Ohio Buckeye	El Castaño de Indias	15. Owl	La Lechuza
16. Carrots	Las Zanahorias	16. Roach	La Cucaracha	16. Lynx	El Lince	16. Shingle Oak	El Roble	16. Warbler	El Gorjeador
17. Grapes	Las Uvas	17. Swallowtail	La Cola de Milano	17. Beaver	El Castor	17. Butternut	El Nogal Blanco	17. Ibis	La Ibis
18. Strawberries	Las Fresas	18. Butterfly	La Mariposa	18. Muskrat	La Rata Almizclera	18. Hardy Catalpa	La Catalpa	18. Seal	La Foca
19. Eggplant	La Berenjena	19. Anglewing	La Mariposa	19. Gray Wolf	El Lobo	19. White Spruce	La Picea Blanca	19. Chipmunk	La Adilla Listada
20. Peas	Los Guisantes	20. Dragonfly	La Libélula	20. Hare	El Liebre	20. Blac Spruce	La Picea Negra	20. Pig	El Cerdo
21. Pumpkin	La Calabaza	21 Owlet Moth	La Polilla	21. Jackrabbit	El Liebre Grande	21. Sugar Pine	El Pino	21. Deer	El Ciervo
22. Trillium	El Trilio	22. Gypsy Moth	La Lagarta	22. Oppossum	La Zariguëya	22. Eastern Red Cedar	El Cedro Rojo	22. Whale	La Ballena
23. Wild Iris	La Flor de Lis	23. Horsefly	El Tábano	23. Bobcat	El Gato Montés	23. Utah Juniper	El Enebro	23. Dinosaur	El Dinosaurio
24. Raspberries	Las Frambuesas	24. Thrip	El Tripso	24. Gray Fox	El Zorro Gris	24. Eastern White Pine	El Pino Blanco	24. Dinosaur	El Dinosaurio